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10/598,194	04/20/2007	Michael Sudakov	062918	1055

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EXAMINER	
LOGIE, MICHAEL J	

ART UNIT	PAPER NUMBER
2881	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentmail@whda.com

Office Action Summary	Application No. 10/598,194	Applicant(s) SUDAKOV ET AL.	
	Examiner MICHAEL J. LOGIE	Art Unit 2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 March 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6 and 10-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6 and 10-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *03/19/2010*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 04 March 2010 has been entered.

Response to Amendment

An “Amendment” was received on 04 March 2010, in response to Office Action of 19 February 2010. Claims 1, 11 and 14 have been amended. Claims 7-9 have been cancelled. Claims 1-6 and 10-18 are now pending.

Response to Arguments

Response to arguments with regards to Okumura (2003/0066958):

Independent claim 1 has been amended to include "only discrete DC levels for trapping ions" and "ions in the ion trap are ejected from said ion trap along the flight path".

Regarding “a set of voltage supplies to provide only discrete DC levels”, Okumura teaches a set of voltage supplies (fig. 1, 41, 43 and 44) which are DC voltage supplies ([0037]). Page 9 of the remarks recites "Applicants respectfully submit that Okumura does not teach or suggest "a set of voltage supplies to provide only discrete DC levels" as recited in amended claim 1. Okumura discloses using an AC power

supply. Thus, claim 1 is structurally distinguishable from Okumura". Since Okumura teaches a set of voltage supplies (41, 43 and 44) and that they are DC ([0037]), it is irrelevant that Okumura teaches AC/RF voltages because Okumura discloses a set of DC voltage supplies.

In regards to the arguments on page 10 reciting “In addition, the present invention as recited in the claims, uses a linear ion trap; on the other hand Okumura uses a 3-D ion trap. Okumura describes that the invention is also applicable to the linear ion trap, which is not convincing.” Paragraph [0063] teaches “This method is also effective in an orthogonal acceleration type TOFMS in which a linear trap (two-dimensional ion trap) is used.” If the method is effective also in a linear ion trap then Okumura teaches a linear ion trap.

Okumura teaches an orthogonal accelerator. The amendment of ejection “along the flight path” is not explicitly taught by Okumura, however, direct injection into a flight path is well known to the art and applying a known technique to a known device ready for improvement will yield predictable results as will be discussed herein below.

Applicant's arguments with respect to claims 1-6 and 10-18 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 14-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Ding (USPN 6,900,433).

In regards to claim 14, Ding teaches a method of extracting ions (inherent in the apparatus of figure 1) from a linear ion trap (col. 5, lines 39-42), said ion trap being driven by a set of digital switches (fig. 1, 31 and 32), said method comprising the following steps; trapping said ions in said ion trap by switching fast between defined by discrete DC levels applied a set of voltage states on the electrodes of said ion trap (col. 3, lines 1-7 for switching between discrete high and low dc voltage levels and col. 3, lines 14-21 trapping ions); cooling said trapped ions by collisions with a buffer gas down to equilibrium (col. 5, lines 12-15 teach cooling ions with a buffer gas such that ions occupy the middle of the trap (i.e. spatial equilibrium)); and switching from a pre-selected trapping state to a final ejection state (col. 5, lines 8-11, teaches ejection in sequence, thus trapping state to ejection state further note the abstract) in condition of pure electrostatic field within the ion trap (col. 5, lines 19-22) in a pre-selected time by elongating the switching period of the trapping states (fig. 3, (b) is elongated every fourth wave which occurs at times seen on the time axis).

In regards to claim 15, Ding teaches where said set of trapping states consists of two states (fig. 3, rectangular wave (b) shows two states high and low), each of said states last for half of a set period (as seen in figure 3).

In regards to claim 16, Ding teaches wherein said buffer gas fills said ion trap at pressures in the range from .01 mTorr to 1mTorr (col. 5, lines 15-17).

In regards to claim 17, Ding teaches wherein said set period is in the range from .3 micro seconds to 1.0 micro seconds (fig. 4 shows period Td wherein the period can be set to suit the intended purpose).

In regards to claim 18, Ding teaches where the final trapping state prior to said ejection state has a duration of one quarter of said set period (as seen in figure 4).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-6 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okumura et al. (US pgPub 2003/0066958) and further in view of Franzen (USPN 5,763,878).

In regards to claim 1, Okumura et al. teach a tandem linear ion trap and time-of-flight mass spectrometer (figure 1, although a three-dimensional trap is shown here paragraph [0063] describes that this method would also be effective in a linear ion trap as well), the ion trap having a straight central axis orthogonal to the flight path of said time-of-flight mass spectrometer (the straight line axis starts at the ion source 2 through the trap 5 and into the orthogonal TOF mass orthogonal accelerator 18) and comprising;

a set of electrodes (fig. 1, 15, 16, 17), at least one said electrode having a slit for ejecting ions towards said time-of flight mass spectrometer (slit in 16 and 17);

a set of voltage supplies (41,43 and 44) to provide discrete DC levels for trapping ions ([0037] teaches endcaps 16 and 17 connected to DC power supplies 41 and 44 and [0038] discusses the grounded endcaps 16 and 17 for accumulating ions (i.e. trapping) which means the DC potential is set to a discrete voltage of a ground potential. Further since there is a controller 14 and this is an apparatus claim, the DC power supply is capable of being set to an number of only discrete DC potentials (see arguments in the Final rejection of 11/09/2009)), for optimizing the distribution of the trapped ions, and for ejecting the trapped ions from the ion trap (as discussed in the arguments in the Final rejection of 11/09/2009) and a number of fast electronic switches (switches seen in dotted box 48) connecting and disconnecting said DC supplies to at least two said electrodes of said ion trap ([0037] switching between DC and AC power supplies, wherein the DC power supplies are disconnected when switched to an AC power supply, thus connecting and disconnecting from the DC power supply);

a neutral gas filling the volume of said ion trap in order to reduce the kinetic energy of trapped ions towards equilibrium (fig. 1,6 note: [0076], note: it is interpreted that increasing the trapping efficiency is equivalent to reducing the kinetic energy because the ions require low energy in order to be efficiently trapped);

a digital controller (fig. 1, 14) to provide a switching procedure for ion trapping, manipulations with ions, cooling and including one state at which all the trapped ions are ejected from said ion trap to said time-of-flight mass spectrometer ([0043]- [0044]).

Okumura differs from the claimed invention by not disclosing all the trapped ions in the ion trap are ejected from said ion trap along the flight path to said TOF-MS.

Franzen teaches all the trapped ions in the ion trap are ejected from said ion trap along the flight path to said TOF-MS (fig. 1, ion trap 12, flight path 19 and discussed in col. 4, lines 50-56).

Franzen modifies Okumura by providing ejection of the ions along the flight path of the TOF.

Since both Okumura and Franzen teach LIT-MS spectrometers, it would be obvious to one of ordinary skill in the art at the time the invention was made to have the ejection technique of Franzen in the device of Okumura because it would “be able to make this storage arrangement much shorter than the length which would correspond to the outpulsing path of normal orthogonal injection” (col. 4, lines 10-14 of Franzen).

In regards to claims 2-3, Okumura differs from the claimed invention by not disclosing wherein said set of electrodes comprises 4 elongated electrodes arranged symmetrically with respect to each other, and arranged to be parallel with respect to an ion trap axis; wherein said at least one electrode having a slit for ejecting ions has a surface of substantially hyperbolic shape with the centre of said slit positioned symmetrically with respect to the apex of said hyperbola.

Franzen teaches wherein said set of electrodes comprises 4 elongated electrodes (fig. 4, 32-35) arranged symmetrically with respect to each other (col. 10, lines 1-4), and arranged to be parallel with respect to an ion trap axis (fig. 2); wherein said at least one electrode having a slit for ejecting ions (col. 8, lines 32-35) has a

surface of substantially hyperbolic shape with the centre of said slit positioned symmetrically with respect to the apex of said hyperbola (col. 8, lines 32-37).

Franzen modifies Okumura by providing a structure to the electrodes in the linear ion trap.

Since both Okumura and Franzen teach LIT-MS spectrometers, it would be obvious to one of ordinary skill in the art at the time the invention was made to have the ejection technique of Franzen in the device of Okumura because it would “be able to make this storage arrangement much shorter than the length which would correspond to the outpulsing path of normal orthogonal injection” (col. 4, lines 10-14 of Franzen).

In regards to claim 4, Okumura et al. teach a tandem linear ion trap and time-of-flight mass spectrometer according to claim 1 wherein said neutral gas has a molecular mass smaller than the mass of ions of interest ([0076], note: helium) and said ion trap is filled with said neutral gas to a pressure in the range from 0.01 mTorr to 1 mTorr ([0076], note: "the degree of vacuum within the ion trap is about 1 mTorr").

In regards to claim 5, Okumura et al. teach tandem linear ion trap and time-of-flight mass spectrometer according to claim 1, wherein said digital controller includes a digital processor capable of calculating an arbitrary switching sequence and control means to control a set of said number of said fast electronic switches according to said arbitrary switching sequence ([0043]- [0044], note: "the controller 14 controls the magnitudes of the voltage to be applied to the gate electrode 4, ring electrode 15, endcap electrodes 16, 17 and orthogonal accelerator 18 as well as the timings of application thereof" is interpreted to mean that the controller has both a digital processor

and a means to control a set of the number of said fast electronic switches since it controls the "timing thereof" which is means it inherently has a processor).

In regards to claim 6, Okumura teaches a tandem linear ion trap and time- of-flight mass spectrometer according to claim 1, wherein said switching procedure includes a final step during which the voltages on said electrodes of said ion trap are periodically switched between a set of states and after a time sufficient for ion cooling the voltages on said electrodes of said ion trap are switched to a final said state for ejection of said ions from said ion trap (this claim is not a structural feature, but a recitation of how the switch is operated. This is non-limiting subject matter: "While features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function" note: MPEP 2114).

In regards to claim 10, Okumura et al. differs from the claimed invention by not disclosing wherein the flight path of said time-of-flight mass spectrometer is positioned inline with the ejection path of ions.

Franzen teaches wherein the flight path of said time-of-flight mass spectrometer is positioned inline with the ejection path of ions (figure 1 shows the trap 12 with flight path 19, figure 3 shows that the ejection path 31 is inline with the flight path of the ions).

Franzen modifies Okumura et al. by providing the ejection and flight path of the ions in-line with each other.

Since both Okumura et al. and Franzen teach a TOF-MS, it would be obvious to one of ordinary skill in the art to have the trap alignment of Franzen in the device of

Okumura because it would provide the time-of-flight spectrometer with an excellent mass resolving power due to the uniform initial energy and low energy spread of the ions.

Okumura in view of Franzen teaches the limitations of claim 11 as above in claim 1. Further Okumura teaches wherein an opposite pair of electrodes (Y pair) of said set of electrodes is connected to a first subset of said number of said fast electronic switches capable of switching at a repetition rate (fig. 3, 21 and 24, which are equivalent to electrode 15 of figure 1 connected to switches 48), and at least one of another oppositely positioned pair of electrodes (X pair) of said set of electrodes is connected to a second subset of said number of said fast electronic switches which has a higher voltage rating (fig. 3, 22 and 23 which are equivalent to electrodes 16 and 17 of figure 1 connected to switches different switches 48, wherein electrodes 21 and 24 conventionally does not require a higher voltage), said second subset of fast electronic switches connects said DC voltage supply to said X electrodes for ejection of said ions ([0051], note figure 1, switches 48 to DC power supplies 41,43 and 44).

Claims 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined invention of Okumura et al. (US pgPub 2003/0066958) and Franzen (USPN 5,763,878) and further in view of Ding (USPN 6,900,433).

In regards to claims 12-13, the combined invention differs from the claimed invention by not teaching wherein said first subset of said fast electronic switches includes 2 serially linked high repetition switches, switching between a positive and

negative voltage to provide said Y pair of said set of electrodes with a rectangular waveform.

Ding teaches wherein said first subset of said fast electronic switches includes 2 serially linked high repetition switches, switching between a positive and negative voltage to provide said Y pair of said set of electrodes with a rectangular waveform (abstract).

Ding modifies the combined invention by providing a rectangular wave voltage to the ion trap.

Since both the combined invention and Ding teach linear ion traps, it would be obvious to one of ordinary skill in the art to have the rectangular waveform of Ding in the device of the combined invention at the time the invention was made because it would provide for a means for varying the duty cycle of every nth wave of the rectangular wave voltage to cause ejection of trapped ions having a predetermined range, thus providing selectivity to the mass scan (col. 3, lines 5-10 of Ding).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Pertinent prior art is closely related art that individually or in combination could be considered grounds for rejection. See references cited for a listing of the pertinent prior art found and the prior art found.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL J. LOGIE whose telephone number is (571)270-1616. The examiner can normally be reached on 8:00 to 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on 571-272-2293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. J. L./
Examiner, Art Unit 2881

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